APPENDIX A

The appealed claims are:

34. In combination, a hybrid motor vehicle comprising:

an electric motor connected to a first pair of wheels;

a cruise mode control circuit having preprogrammed cruise mode operating conditions, said control circuit automatically activating first coupling means for connecting a combustion engine to a second pair of wheels during a cruise mode on condition and deactivating said first coupling means during a cruise mode off condition, and said control circuit activating second coupling means for connecting said combustion engine to an electric generator for charging a battery during the cruise mode off condition;

said combustion engine running in an optimum mode at substantially constant speed and power output level.

35. The combination according to claim 34 wherein said cruise mode off condition for charging a battery comprises a speed less than a predetermined value.

36. The combination according to claim 34 wherein in the event of an inoperable electric power condition under cruise mode off condition, said combustion engine is connected by said first coupling means to said second pair of wheels.

37. A controller of a hybrid electric vehicle having an engine (22) and a motor (12) for controlling driving of the engine (22) and the motor (12), comprising:

a battery (58) for supplying electric power to the motor (12) ;

motor-generated driving force transfer means (14) for transferring the driving force generated by the motor (12) to wheels (18);

a power generator (78) driven by the engine (22) to supply generated electric power to the battery (58);

engine-generated driving force transfer means (75) for transferring the driving force generated by the engine (22) to the wheels (28);

means for detecting a vehicle running state (44) ; and

control means (30) for controlling whether to transfer a driving force generated by an engine (22) to a power generator (78) or wheels (28) in accordance with a vehicle running state, wherein the control means (30) transfers the driving force generated by the engine (22) to wheels (28) when said running state is more than a predetermined value, transfers the driving force generated by the engine (22) to the power generator (78) when said running state is less than a predetermined value.

38. A controller according to claim 37 wherein said control means (30) sets a period for transferring driving forces generated by the engine (22) to wheels (28) when said running state changes from a value less than a predetermined value to a value larger than the predetermined value.

39. A controller according to claim 38 wherein said period is about 45 seconds.

40. A controller according to claim 37 wherein said running state is vehicle speed.

41. A controller according to claim 40 wherein said vehicle speed is about 40 miles per hour.

46. A hybrid vehicle power train comprising an engine and an electric motor;

a first torque flow path including a clutch and transmission coupled between said engine and traction wheels of the hybrid vehicle;

a second torque flow path coupled between the electric motor and traction wheels of the hybrid vehicle; and,

a logic control circuit for interrupting torque flow in said first torque flow path without interrupting operation of said engine during disengagement of said clutch and application of torque through said second torque flow path to the traction wheels of the hybrid vehicle.

47. A hybrid vehicle power train according to claim 46 wherein said traction wheels comprise four-wheel drive.

48. A hybrid drive vehicle power train according to claim 46 wherein in the event of an inoperable electric motor, said first torque flow path provides torque to traction wheels of the hybrid vehicle.

49. A hybrid vehicle power train according to claim 46 wherein said logic control circuit controls the period of torque transfer between said first and second torque flow paths to traction wheels of the hybrid vehicle.

50. A hybrid motor vehicle comprising in combination:

an electric motor propulsion system which shifts to combustion engine propulsion for vehicle operation when cruise mode is reached;

said cruise mode occurring when rapidly shifting power and speed demands are not occurring for predetermined periods of time.

51. A hybrid motor vehicle comprising in combination:

an engine;

an electric motor;

a storage device;

said electric motor powering said hybrid vehicle at lower speeds;

said engine powering said vehicle at higher speeds; and said engine operatively connected through a charging path for charging said battery at lower speeds.

52. A hybrid motor vehicle according to claim 50 wherein said speed demands do not drop below 40 mph for predetermined time periods of 45 seconds.

53. In combination in a motor vehicle having a pair of wheels at one end of the vehicle and a pair of wheels at an opposite end of the vehicle:

an electric motor for powering one of said pair of wheels;

a low power combustion engine for powering one of said pair of wheels;

a battery for storing electrical energy;

a cruise mode control having preprogrammed cruise mode operating conditions which includes a vehicle operating speed exceeding a predetermined level and for a predetermined time interval, said control circuit automatically coupling said electric motor to one of said pair of wheels when said cruise mode operating conditions have been satisfied, coupling said combustion engine to one of said pair of wheels when said cruise mode operating conditions have been satisfied, and

decoupling said combustion engine from said one pair of wheels when said cruise mode operating conditions have not been satisfied;

said cruise mode control circuit adapted to maintain said combustion engine in a constant on mode, to couple said combustion engine to an electric power generator for charging said battery when cruise mode conditions have not been satisfied, and to decouple said combustion engine from said electric power generator when said cruise mode conditions have been satisfied.

54. In combination in a hybrid vehicle;

an electric motor;

a combustion engine;

a cruise mode logic control circuit;

said cruise mode logic control circuit responsive to a plurality of vehicle operating parameters including vehicle speed and accelerator pedal information for providing cruise mode logic output control signals for controlling operation of said electric motor and said combustion engine.

55. A method of operating a hybrid vehicle having electric motor and internal combustion engine power comprising:

a. rapidly capturing power from a continuously running low horsepower internal combustion engine to charge a fast charge-discharge battery without loss of said power, and,

b. providing instant powerful acceleration by operator depression of the throttle pedal to provide electric propulsion while in the cruise mode when the speed of the vehicle is dropping.

56. A method of operating a hybrid motor vehicle having an electric motor and an internal combustion engine comprising:

a. operating the internal combustion engine within a small range of speeds about its most efficient operating speed from a power and pollutant output standpoint; and,

b. utilizing the internal combustion engine to charge a nickel cadmium fast charge-discharge battery when the internal combustion engine is not employed to drive the motor vehicle.

57. In the method of operating a hybrid motor vehicle having internal combustion engine power and electric motor power in the cruise mode and when cruise mode conditions are not satisfied;

a. utilizing the internal combustion engine power in said cruise mode and utilizing the electric motor power primarily when conditions for said cruise mode conditions are not satisfied, the cruise mode occurring when rapidly shifting power and speed demands are not occurring.

58. A method of operating a hybrid motor vehicle having an electric motor and an internal combustion engine comprising:

a. utilizing an internal combustion engine having a horsepower approximately 20 to 30 percent of the horsepower of an equivalent weight internal combustion only powered vehicle; and,

b. operating said internal combustion engine at relatively constant speed and load demands in the cruise mode.

59. In combination in the method of operating a hybrid vehicle having an electric motor and an internal combustion engine:

a. causing a fast charge-discharge battery to power the electric motor on throttle demand; and,

b. transferring power output into electric power conserved in a fast charge-discharge battery when the internal combustion engine continues to run.

60. A method of operating a hybrid motor vehicle having an electric motor and an internal combustion engine operable in the cruise mode comprising:

controlling operation of the hybrid vehicle in said cruise mode including controlling the operation of the electric motor and internal combustion engine in response to vehicle operating parameters.

61. A hybrid vehicle comprising:

an engine for propelling the hybrid vehicle, said engine having an output shaft;

power transfer means for transferring an output power of said engine from the from the output shaft thereof to drive wheels of the hybrid vehicle;

an electric motor for propelling the hybrid vehicle, said electric motor having an output shaft;

power transfer means for transferring an output power of said electric motor from the output shaft thereof to drive wheels of the hybrid vehicle;

means for coupling said power transfer means for transferring an output power of said electric motor from the output shaft thereof to drive wheels of the hybrid vehicle upon starting the hybrid vehicle;

means for uncoupling said power transfer means for transferring an output power of said engine from the output shaft thereof to drive wheels of the hybrid vehicle upon starting the hybrid vehicle; and,

means for coupling said power transfer means for transferring an output power of said engine from the output shaft thereof to drive wheels of the hybrid vehicle when the hybrid vehicle increases above a predetermined speed.